

We Claim:

1. An automatic bar code symbol reading system, comprising:
 - a housing having a light transmission aperture through which light of at least one wavelength can exit and enter into the housing;
 - a bar code presence detection mechanism in the housing, for detecting a presence of a bar code located in a scan field defined external to the housing, and for automatically generating an activation signal in response to the detection of the presence of the bar code located in the scan field;
 - an activatable scan data producing mechanism in the housing, for producing scan data from a bar code located in the scan field, the scan data producing mechanism including:
 - a laser beam generating mechanism for generating a laser beam,
 - a directing mechanism for directing the laser beam through the light transmission aperture and into the scan field,
 - a laser beam scanning mechanism for repeatedly scanning the laser beam across the scan field and the detected bar code symbol,
 - a laser light detecting mechanism for detecting the intensity of laser light reflected off the bar code symbol and passing through the light transmission aperture as the laser beam is repeatedly scanned across the scan field and the detected bar code, and
 - a data producing mechanism for automatically producing scan data indicative of the detected intensity;

an activatable scan data processing mechanism for processing produced scan data so as to detect and decode a bar code symbol in the scan field, and for automatically producing symbol character data representative of the decoded bar code symbol; and

a control mechanism for controlling the operation of the automatic bar code symbol reading system, the control mechanism including:

(i) an activation mechanism for automatically activating the activatable scan data producing mechanism and the activatable scan data processing mechanism for up to a predetermined time period in response to the generation of the activation signal, and

(ii) a mechanism for automatically deactivating the activatable scan data producing mechanism and the activatable scan data processing mechanism in response to the failure of the scan data processing mechanism to detect and decode the bar code symbol on the detected object within the predetermined time period.

2. The automatic bar code symbol reading system of claim 1, wherein the laser beam generating mechanism comprises a laser diode.

3. The automatic bar code symbol reading system of claim 1, wherein the bar code symbol has first and second envelope borders, and wherein the scan data processing mechanism comprises a mechanism for detecting the first and second envelope borders of the bar code symbol, and mechanism for decoding the detected bar code symbol.

4. The automatic bar code symbol reading system of claim 1, wherein the laser beam generating mechanism is operated in a pulsed laser mode so as to generate a pulsed laser beam, which is directed through the light transmission aperture and repeatedly scanned across the scan field to detect a presence of a bar code symbol in the scan field.

5. The automatic bar code symbol reading system of claim 1, wherein the scan data processing mechanism and the control mechanism are disposed in the housing.

6. The automatic bar code symbol reading system of claim 5, wherein the housing comprises a head portion and a handle portion.

7. The automatic bar code symbol reading system of claim 6, wherein the laser beam producing mechanism comprises a visible laser diode in the housing.

8. The automatic bar code symbol reading system of claim 7, wherein the laser light detecting mechanism comprises a photodetector in the housing.

9. The automatic bar code symbol reading system of claim 7, wherein the scan data processing mechanism and the control mechanism comprise a programmed microprocessor in the housing.

10. The automatic bar code symbol reading system of claim 9, which further comprises a housing support stand for supporting the housing above a workspace so that the automatic bar code symbol reading system can be used to read bar code symbols on objects while the housing is supported in the support stand.

11. The automatic bar code symbol reading device of claim 9, wherein the predetermined time period is greater than about 3 seconds.

12. The automatic bar code symbol reading system of claim 1, wherein the control mechanism further comprises a mechanism for automatically continuing activation of the activatable scan data producing mechanism and the activatable scan data processing mechanism for an additional time period in response to the detection and decoding of the bar code symbol within the predetermined time period to permit detection and decoding of another bar code symbol in the scan field which is different than the bar code symbol detected and decoded within the predetermined time period.

13. The automatic bar code symbol reading system of claim 4, wherein the control mechanism further comprises a mechanism for automatically continuing activation of the activatable scan data producing mechanism and the activatable scan data processing mechanism for an additional time period in response to the detection and decoding of the bar code symbol within the predetermined time period to permit detection and decoding of another bar code symbol in the scan field which is different than the bar code symbol detected and decoded within the predetermined time period.

14. An automatic bar code symbol reading system, comprising:

- a housing having a light transmission aperture through which light of at least one wavelength can exit and enter the housing;
- a bar code presence detection mechanism in the housing, for detecting a presence of a bar code located within at least a portion of a scan field defined external to the housing;
- an activatable laser beam source in the housing for producing, when activated, a laser beam;
- a laser beam detecting mechanism in the housing, for directing the visible laser beam through the light transmission aperture and into the scan field;
- an activatable scanning mechanism in the housing for repeatedly scanning, when activated, the laser beam across the scan field and across a bar code symbol in the scan field;
- a light detection mechanism in the housing, for detecting the intensity of laser light reflected off the bar code symbol as the laser beam is repeatedly scanned across the scan field and the bar code symbol, and for automatically producing scan data indicative of the detected intensity of the reflected laser light;
- a scan data processing mechanism for processing produced scan data so as to detect and decode the bar code symbol, and upon detecting and decoding the bar code symbol, automatically producing symbol character data representative of the decoded bar code symbol;

a control mechanism for controlling the operation of the automatic bar code symbol reading system, the control mechanism including:

(i) a mechanism for automatically activating the activatable laser beam source and the activatable scanning mechanism for up to a predetermined time period in response to the generation of the activation signal, and

(ii) a mechanism for automatically deactivating the activatable laser beam source and the activatable scanning mechanism in response to the scan data processing mechanism failing to detect and decode the bar code symbol within the predetermined time period.

15. The automatic bar code symbol reading device of claim 14, wherein the light detection mechanism has an operative scanning range measured from the transmission aperture out towards a region within the scan field, and wherein the scan field is characterized by at least one scanning plane having an essentially planar extent.

16. The automatic bar code symbol reading system of claim 14, wherein the bar code symbol has first and second envelope borders, and wherein the scan data processing mechanism comprises a mechanism for detecting the first and second envelope borders of the bar code symbol, and a mechanism for decoding the detected bar code symbol.

17. The automatic bar code symbol reading system of claim 14, wherein the housing comprises a head portion and a handle portion, and wherein the activatable laser

beam source, the laser beam directing mechanism, the activatable scanning mechanism, and the light detection mechanism are in the head portion.

18. A method of reading bar code symbols using an automatic unit, the method comprising the steps of:

(a) supporting the unit adjacent an object bearing a bar code symbol so that the bar code symbol is located within at least a portion of a scan field defined external to the unit, and the unit is disposed in a non-contacting relationship with the object;

(b) automatically generating an activation signal in response to a detection of a presence of the bar code symbol located in the scan field;

(c) in response to the generation of the activation signal during step (b),

(1) automatically activating for up to a predetermined time period, a laser beam source and an electrically driven scanning element in the unit so as to produce a laser beam which is directed through a light transmission aperture in the unit and repeatedly scanned across the scan field and the detected bar code symbol,

(2) automatically detecting, at the unit, the intensity of laser light reflected off the detected bar code symbol, and automatically producing scan data indicative of the detected intensity of the reflected laser light, and

(3) automatically processing produced scan data for up to the predetermined time period in order to decode the detected bar code symbol; and

(d)(1) upon decoding the detected bar code symbol within the predetermined time period of step (c), automatically producing symbol character data representative of the decoded bar code symbol, and

(d)(2) upon failing to decode the detected bar code symbol within the predetermined time period during step (c), automatically deactivating the laser beam source and the electrically driven scanning element.

19. A method of reading bar code symbols using an automatic unit, the method comprising the steps of:

(a) supporting the unit adjacent an object bearing a bar code symbol so that the bar code symbol is located in at least a portion of a scan field defined external to the unit, and the unit is disposed in a non-contacting relationship with the object;

(b) transmitting pulsed energy from a pulsed energy source in the unit, into at least a portion of the scan field, and in response to receiving at the unit at least a portion of the transmitted pulsed energy reflected off the bar code in the scan field, automatically generating an activation signal;

(c) in response to the generation of the activation signal during step (b),

(1) automatically activating for a predetermined time period, a laser beam source and an electrically driven scanning element in

the unit so as to produce a laser beam which is projected through a light transmission aperture in the unit and repeatedly scanned across the scan field and the bar code symbol,

(2) automatically detecting, at the unit, the intensity of laser light reflected off the bar code symbol, and automatically producing scan data indicative of the detected intensity of the reflected laser light, and

(3) automatically processing produced scan data for up to the predetermined time period so as to decode the detected bar code symbol; and

(d)(1) upon decoding the detected bar code symbol within the predetermined time period during step (c), automatically producing symbol character data representative of the decoded bar code symbol on the detected object, and

(d)(2) upon failing to decode the detected bar code symbol within the predetermined time period during step (c), automatically deactivating the laser beam source and the electrically driven scanning element.

20. The method of claim 19, wherein the pulsed energy is a pulsed laser light signal, and step (b) comprises transmitting the laser light signal from the unit into at least a portion of the scan field, and automatically generating the activation signal in response to a detection of the transmitted laser light signal reflected off a bar code located in the scan field.

21. The method of claim 20, wherein the bar code symbol has first and second envelope borders, and wherein step (b) comprises processing produced scan data so as to detect the bar code symbol by detecting the first and second envelope borders of the bar code symbol.

22. An automatic bar code symbol reading system, comprising:
a housing having a light transmission aperture through which light of at least one wavelength can exit and enter the housing;

a bar code presence detection mechanism, situated in the housing, for transmitting a pulsed laser light signal through the aperture, outwardly into a scan field defined externally with respect to the housing, and for automatically generating a first activation signal in response to the detection of the transmitted laser light signal reflected off a bar code symbol located in the scan field;

the bar code presence detection mechanism further comprising a scanning mechanism for producing a laser light beam within the hand-supportable housing and for directing the light beam through the light transmission aperture, and repeatedly scanning the visible light beam across the scan field, and across a detected bar code symbol, so as to produce scan data to thereby permit a decoding of the detected bar code symbol;

a light detection mechanism in the housing, for detecting the intensity of light reflected off the bar code symbol and passing through the light transmission aperture, and automatically producing scan data indicative of the detected light intensity;

a processing mechanism for processing the produced scan data so as to decode the detected bar code symbol, and automatically producing symbol character data representative of the decoded symbol in response to the decoding of the detected bar code symbol; and

a control mechanism for controlling the operation of the automatic bar code symbol reading system, the control mechanism including a mechanism for automatically activating the scanning mechanism for up to a first predetermined time period in response to the generation of the first activation signal.

23. The automatic bar code symbol reading system of claim 22, wherein the scanning mechanism comprises a laser diode in the housing for producing the visible laser beam, and an electrically driven scanning element for repeatedly scanning the laser beam across the scan field and the detected bar code symbol.

24. The automatic bar code symbol reading system of claim 23, wherein the control mechanism further comprises a mechanism for automatically deactivating the scanning mechanism and the processing mechanism in response to the processing mechanism failing to generate the first activation signal within a first predetermined time period.

25. The automatic bar code symbol reading system of claim 24, wherein the control mechanism further comprises a mechanism for automatically deactivating the

scanning mechanism and the processing mechanism in response to the processing mechanism failing to decode the detected bar code symbol within a second predetermined time period.

26. The automatic bar code symbol reading system of claim 24, wherein the housing comprises a head portion and a handle portion, and wherein the bar code presence detection mechanism and the scanning mechanism are in the head portion.

27. The automatic bar code system reading system of claim 22, wherein the scanning mechanism has an operative scanning range measured from the transmission aperture out towards a region within the scan field, wherein the scan field is characterized as having at least one scanning plane having an essentially planar extent.

28. An automatic bar code symbol reading system, comprising:
a housing having a light transmission aperture through which light of at least one wavelength can exit and enter the housing;

a bar code presence detection mechanism in the housing, for automatically detecting a presence of a bar code symbol located in a scan field defined external to the housing, and for automatically generating a first activation signal in response to the detection of the presence of the bar code symbol in the scan field;

a scan data producing mechanism in the housing for producing scan data from the detected object located in the scan field, the scan data producing mechanism having an operative scanning range measured from the transmission aperture out towards a region

within the scan field, the scan field being characterized by at least one scanning plane having an essentially planar extent,

the scan data producing mechanism including

(i) a laser beam generating mechanism for generating a laser beam within the housing,

(ii) a laser beam scanning mechanism for projecting the laser beam through the light transmission aperture and for repeatedly scanning the laser beam across the scan field and a bar code symbol in the scan field, and

(iii) a laser light detecting mechanism for detecting the intensity of laser light reflected off the bar code symbol and passing through the light transmission aperture, and for automatically producing scan data indicative of the detected intensity;

a processing mechanism for processing produced scan data so as to decode the detected bar code symbol, and automatically producing symbol character data representative of the decoded bar code symbol in response to the decoding of the detected bar code symbol; and

a control mechanism for controlling the operation of the automatic bar code symbol reading system, the control mechanism including a mechanism for automatically activating the scan data producing mechanism and the processing mechanism for up to a first predetermined time period in response to the generation of the activation signal.

29. The automatic bar code symbol reading system of claim 28, wherein the control mechanism further comprises a mechanism for automatically deactivating the scan data producing mechanism and the processing mechanism in response to the processing mechanism failing to generate the activation signal within the first predetermined time period, and a mechanism for automatically deactivating the scan data producing mechanism and the processing mechanism in response to the processing mechanism failing to produce symbol character data within a second predetermined time period.

30. An automatic bar code symbol reading system comprising:
a housing having a light transmission aperture through which visible light can exit and enter the housing;

a bar code presence detection circuit in the unit, for receiving energy from a scan field defined external to the housing, and for automatically generating an activation signal in response to the detection of energy reflected off a bar code symbol located in a scan field;

a laser beam source in the housing for producing a laser beam;

a laser beam directing mechanism for directing the laser beam through the light transmission aperture and into the scan field;

an electrically driven scanning element in the housing, for repeatedly scanning the laser beam across the scan field, wherein the scan field is defined external to the housing;

a laser light detection mechanism in the housing, for detecting the intensity of laser light reflected off the bar code symbol as the laser light beam is repeatedly scanned

across the scan field and the detected bar code symbol, and automatically producing scan data indicative of the detected intensity of the reflected laser light, the light detection mechanism having an operative scanning range measured from the transmission aperture out towards a region within the scan field;

a processing mechanism for processing produced scan data in order to decode the detected bar code symbol and, upon decoding the detected bar code symbol, automatically producing symbol character data representative of the bar code symbol; and

a control mechanism for automatically controlling the operation of the automatic bar code symbol reading system, the control mechanism including a mechanism for automatically activating the laser beam source, the electrically driven scanning element, the laser light detection mechanism and the processing mechanism for up to a first predetermined time period in response to the generation of the activation signal.

31. The automatic bar code symbol reading system of claim 30, wherein the control unit further comprises a mechanism for automatically activating the laser beam source, the electrically driven scanning element, the laser light detection mechanism and the first processing mechanism for up to a second predetermined time period only in response to the production of the symbol character data within the second predetermined time period, thereby permitting a detection of a second bar code symbol disposed in the scan field.

32. The automatic bar code symbol reading system of claim 30, wherein the control mechanism further comprises:

a mechanism for automatically deactivating the laser beam source and the electrically driven scanning element in response to the failure of the processing mechanism to generate the activation signal within the first predetermined time period.

33. The automatic bar code symbol reading system of claim 32, wherein the control mechanism further comprises a mechanism for automatically deactivating the laser beam source and the electrically driven scanning element in response to the failure of the processing mechanism to decode the detected bar code symbol within the first predetermined time period.

34. The automatic bar code symbol reading system of claim 30, wherein the housing comprises a head portion and a handle portion, and wherein the bar code presence detection mechanism, the laser beam source, the laser beam directing mechanism, the electrically driven scanning element and the laser light detection mechanism are disposed in the head portion.

35. A method of reading bar code symbols using an automatic hand-supportable unit having an operative scanning range, the method comprising the steps of:

(a) supporting the hand-supportable unit adjacent an object bearing a bar code symbol so that the object is located within at least a portion of a bar code symbol presence detection field defined external to the hand-supportable unit and having an

essentially volumetric extent, and the hand-supportable unit is disposed in a substantially non-contacting relationship with the object;

(b) at the hand-supportable unit, receiving energy reflected from the bar code symbol presence detection field and automatically generating a first activation signal in response to the detection of energy reflected off a bar code symbol in the bar code symbol presence detection field;

(c) in response to the generation of the first activation signal, automatically activating for a first predetermined time period by a control circuit, a laser beam source and an electrically driven scanning element in the hand-supportable unit so as to produce a laser beam which is projected through a light transmission aperture in the hand-supportable housing and repeatedly scanned across the bar code symbol presence detection field and the bar code symbol on the detected object, the field being defined external to the hand-supportable housing along an operative scanning range;

(d) automatically detecting at the hand-supported unit, the intensity of laser light reflected off the detected bar code symbol as the light beam is scanned across the bar code symbol, and automatically producing a first electrical signal responsive to the detected intensity of the reflected laser light;

(e) automatically continuing, for up to a predetermined time period, the activation of both the laser beam source and the electrically driven scanning mechanism so as to continue to produce the laser beam and repeatedly scan the laser beam across the field and the detected bar code symbol;

(f) automatically detecting at the hand-supported unit, the intensity of laser light reflected off the detected bar code symbol, and producing an electrical signal responsive to the detected intensity of the reflected laser light; and

(g) automatically processing the electrical signal for up to the predetermined time period in order to decode the detected bar code symbol on the detected object, and upon decoding the detected bar code symbol, automatically producing symbol character data representative of the decoded bar code symbol.

36. A method of scanning a bar code symbol on an object by use of an automatic hand-supportable bar code symbol scanning device having a hand-supportable housing, the method comprising the steps of:

(a) automatically detecting the presence of the bar code symbol within a bar code presence detection field defined external to the hand-supportable housing, by sensing energy reflected off the bar code symbol;

(b) in automatic response to the determination of the bar code symbol within the detection field during step (a), producing scan data from the detected code symbol using the laser beam, and collecting the produced scan data.

37. The method of claim 36, which further comprises:

(c) processing the scan data collected during step (b) in order to decode the code symbol, and upon decoding the bar code symbol, producing symbol character data corresponding to the decoded code symbol.